Properties of Matter Experiment

Honors Chemistry

Problem: How can we organize and classify matter so as to better understand the world around us?

Introduction: One of the principle techniques used by chemists is the classification of various types of matter according to their physical and chemical properties. This experiment appears short, but there is a lot to it. You will be given several samples of matter and you are to gather as much information as you can about each one. You will use standard laboratory apparatus: balances, test tubes, and so on, as well as a special device called a conductivity tester. As its name implies, the conductivity tester is used to determine whether or not a solid or liquid can conduct an electric current.

Prelaboratory Assignment:

1. Read the introduction and procedure before you begin
2. Answer the prelab questions
   1. No food or drink should ever be brought into or consumed in the lab. Why not? Drinks could become mixed up with the chemicals. Food and drinks could interfere with the outcome of the lab.
   2. As the procedure describes, you should never test the odor of a reagent by holding it directly under your nose. Why not? If you held it directly under your nose then you could possibly breathe the reagent in and that could be dangerous to your body.
3. Create a data table to help you organize all of the observations and measurements you will take during the procedure. The data table should include, but isn’t limited to: Substance Tested, Pure Substance/Mixture, Element/Compound, Homo/Hetero, Physical State, Odor/Appearance, Flammable

| Substance Tested | Pure Substance/Mixture | Element/Compound | Homo/Hetero | Physical State | Odor/Appearance | Flammable |
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1. Record the safety hazards of each chemical (Use the MSDS website)

Silicon-Direct contact with eyes causes irritation and redness. Contact with skin causes irritation. If inhaled, it can cause headache and drowsiness.

Sulfur-Causes eye irritation. Causes skin irritation and possible burns. If ingested, may cause nausea, vomiting, and diarrhea. If inhaled, may cause burning pain in the nose and throat, coughing, wheezing, and shortness of breath.

Steel Wool (iron) -Irritation of eyes. If inhaled can cause irritation, coughing, and shortness of breath.

Magnesium-Harmful if swallowed or inhaled. Severe irritation.

Ammonium-Can cause irritation when in contact with skin or eyes. If inhaled, it can cause irritation to the nose, with a sore throat and coughing.

Chloride- May cause eye and skin irritation. If ingested, can cause nausea, vomiting, and convulsions.

Sucrose (table sugar)-None listed.

Washing Soda (sodium carbonate)-Eye and skin irritation. If inhaled, can cause irritation to nose, throat, and respiratory tract.

Copper Sulfate Crystals-Can cause skin, eye, and respiratory irritation. If ingested, can cause abdominal pain.

Materials: Wooden splints, Conductivity Tester, Tweezers, Bunsen burner, spatula, watch glass, matches, watch glass, test tubes

Reagents: silicon, sulfur, steel wool (iron), magnesium, ammonium chloride, sucrose (table sugar), washing soda (Sodium carbonate), copper sulfate crystals

Liquid Samples: ethyl alcohol, distilled water, vinegar, and household ammonia

Safety

1. Most of the reagents are nontoxic, but common sense precautions should always be taken when handling chemicals.
2. Due to toxicity, especially of vapors, your teacher will demonstrate the combustion of sulfur.
3. Even dilute acids are harmful to skin and clothing. The same is true of bases.
4. Do not taste anything in the laboratory.
5. Use proper technique when checking for odors: Gently wave the palm of your hand above the surface of the sample to waft vapors towards your nose.

Procedure

1. Observe each sample individually before testing to see how it reacts with various testing reagents.
2. For each solid
   1. Describe appearance (color, texture, etc.), odor, flexibility, flammable or inflammable, reactivity with acids (HCl), reactivity with bases (NaOH).
3. Work with the smallest amount possible.
4. Test the flammability of a solid. Use a wet wood splint to hold a very small piece in the burner flame.
5. For each liquid
   1. Describe appearance & odor
   2. Test the flammability of a liquid. Place a few drops on a watch glass and touch the liquid with a lighted wooden splint (Do not throw splints in sink – Let them cool, then throw them in the trash.)
   3. Test ~1 mL of the liquid with 1 drop of Universal Indicator and record the color (determine if it is acidic, basic or neutral)
6. Solubility
   1. Solids: place a very small sample (2-3 crystals) onto a clean watch glass. Add 10-15 drops of distilled water and stir. If the sample dissolves, test the solution with the conductivity tester, and then add a drop of universal indicator. If it doesn’t dissolve, repeat the test with a new sample and 10-15 drops of paint thinner. If it dissolves now, test for conductivity and acidity.
   2. Liquids: Place about 1 cm of water in a small test tube. Add about 4-5 drops (just enough to see) of the liquid to be tested. If it seems to disappear into the water, it’s soluble. If it can be seen as a bubble floating on the top of the water (or bottom), it isn’t soluble.
7. In separate test tubes, test about 1 mL of sodium hydroxide solution and hydrochloric acid with a drop of Universal Indicator. Observe and record the results.

Clean-up:

1. Solid Residues
   1. Place the iodine and naphthalene in labeled containers
   2. All others go in the trash
2. Liquids -All solutions can be rinsed down the drain with lots of water

Analysis & Conclusions

Summarize your findings, included (but not limited to) the following suggestions

1. Categorize the samples into groups that show similarities. Clearly ID the reasons behind your groups.
2. What generalizations can you make about: solubility’s? Flammability?
3. Discuss any further tests that may have given you more information about the various samples.
4. Which observations showed physical changes? Chemical changes? How did you know?